

TESTIMONY OF BRIAN COATS

I have been an employee of the State Water Resources Control Board (State Water Board) for the past 16 years, and am currently employed by the State Water Board. In 1996 I received a Bachelor of Science Degree in Chemical Engineering from The University of California at Davis, and have been registered as a Professional Chemical Engineer in California since 2011. Since September 2012, I have supervised an enforcement unit in the State Water Board's Division of Water Rights (Division) as a Senior Water Resources Control Engineer. As a Senior Water Resources Control Engineer, I supervise a group of engineers working on water rights compliance and enforcement actions. In my work with the State Water Board, I have become familiar with the California water rights system and with the concepts of water supply and water demand, as well as with the databases used by the State Water Board to collect the information submitted by diverters. A copy of my resume is Prosecution Team Exhibit WR-10.

My testimony, herein provided, identifies my personal knowledge of the evidence, actions, and rationale for the Division's recommendation that an Administrative Civil Liability (ACL) Complaint be issued against Byron-Bethany Irrigation District (BBID), and that a Cease and Desist Order (CDO) be issued against the West Side Irrigation District (WSID). Since January 2014, I have been actively involved with the Division's supply and demand analysis which determines if water supplies are sufficient to meet current water use demands in critical watersheds during the 2014 and 2015 drought.

My written testimony outlines water supply availability analysis the Division undertook in 2015 in order to determine whether there was sufficient supply to satisfy demand in certain watersheds affected by the Drought. I participated in this effort, supervised by Kathy Mrowka and John O'Hagan. I supervised Jeffrey Yeazell, who is an engineer in my enforcement unit. Mr. Yeazell and I conducted the water availability analyses described here and in Mr. Yeazell's testimony (WR-11) at the direction of Ms. Mrowka and Mr. O'Hagan.

Water Rights

Background

The State Water Board has been vested by the Legislature with the authority to prevent unauthorized diversions of water and to supervise the water rights priority system. (See, e.g., Wat. Code §§ 174, 186, 1050, 1051, 1051.5, 1052, 1825.) Drought management of water rights is necessary to insure that water to which senior right holders are entitled is actually available to them, which requires that some water remain in most streams to satisfy senior demands at the furthest downstream point of diversion of these senior water rights.

The water rights priority system provides the primary basis for determining which users may divert water, and how much, when there is insufficient water in the system for all users. If water supplies are insufficient to meet all demands in a given area, due to low rainfall and/or snowpack levels, the water rights priority system is used to allocate limited supplies based on relative priority of rights. With respect to water rights priority, the overriding governing principle is “First in Time, First in Right” which assigns the most protected and senior water right to whoever has documented and preserved their use based on: the date of filing (post-1914), posting (pre-1914) or assignment to private ownership (riparian). While there are many types of specialized water rights, there are three main classes (riparian, pre-1914 and post-1914) which consume the bulk of the State’s supplies in any given year.

Classes of Rights – Riparian, Pre-1914 and Post-1914

Riparian right holders generally have the most senior priority due to their parcel’s date of transfer to private ownership. Transfer of the majority of parcels to private ownership in California occurred in the late 1800s which, following the “First in Time, First in Right” principle, results in riparian claims of right having priority over most water rights in California. One limiting constraint to riparian claims of right is they are not allowed to store water; they can only divert natural flows in an adjacent stream or water course. In addition, in the event of a water shortage notice issued to riparian water rights holders, all the riparian right holders in the impacted area must absorb a correlative reduction, or equally share in the reduction, since all riparian rights have an equal priority to the water.

Pre-1914 claims of right are claims made prior to the Water Commission Act of 1914. Most pre-1914 claims of rights are junior in priority to riparian right holders but can divert non-natural or abandoned sources of water unlike riparian holders. The pre-1914 claims of right can be senior to the above riparian class of right if their posting date occurred prior to the competing riparian parcel’s date of transfer to private ownership, again, “First in Time, First in Right.”

The third priority class of rights which are junior to the above two classes are post-1914 water rights which accrued after the Water Commission Act of 1914.

Types of Water - Natural, Stored & Abandoned

The above three classes are prioritized in order to allocate the limited amount of “natural” water supply. The key word here is “natural,” as “stored” or “imported” water is not subject to priority allocation. When water is stored or imported from another watershed, the entity that stored or imported the water has the paramount right to that water. Therefore, while a water shortage notice may have been issued, an entity with stored or imported water may use that water since it is not considered “natural” flow. As mentioned earlier, holders of riparian

water rights may not use stored water since they only have the right to divert the natural flow of water abutting their parcel without any provision for storage.

Water can also be classified as “abandoned” and/or “return flow”. Abandoned water is water that has been used for a purpose with the excess or unneeded amount released with no claim of ownership. Since the abandoned water has been used and no longer considered “natural,” it is only currently available for diversion by appropriative diverters which include the pre-1914 and post-1914 classes of water rights. Abandoned water may also be a wastewater discharge from a water treatment plant where the discharger has abandoned its claim to the water. A similar class of abandoned water is called return flow which is excess flow that leaves the field following the application of irrigation water. While return flows can be sourced from riparian or appropriative (pre-1914 and post-1914 water rights) diversions, they are only available for “recapture” by appropriative water rights (pre-1914 and post-1914) since the “non-natural” or “abandoned” designation prevents riparians from diverting.

Why is this important? When Division staff perform a water supply and demand analysis for purposes of determining water availability during drought, we only consider the natural sources of water for the supply with an adjustment for return flows, if applicable. While abandoned flows may be present, the Division would be double-counting those flows if the original source of water, prior to being classified as abandoned, was sourced from natural flow.

These distinctions between classes of water rights mean that it may not always be clear to a junior diverter whether there is sufficient flow in the system to support their diversion. For example, an appropriative diverter may see water near their point of diversion (i.e. pump) and not be sure if that water is available to them or needed to support senior water uses downstream. Similarly, it can be difficult for a riparian to know if water is natural flow, or stored or imported water, and whether, when, and to what extent correlative reductions in water use are needed due to the need to share limited supplies amongst riparians.

This is where the Division’s supply and demand analysis becomes necessary. In accordance with the State’s water right priority system, the State Water Board staff notifies diverters of a water shortage when sufficient natural flows in a watershed are not available for a water user’s needs, based on their priority of right.

Drought Notices & Notices of Water Unavailability

On January 17, 2014, Governor Brown issued a state of emergency via Proclamation 1-17-2014, due to drought conditions (WR-23 is a true and correct copy). In response to the governor’s proclamation, the State Water Board staff issued a notice of surface water shortage

and potential curtailment on the same day which was posted to the State Water Board's website (WR-24 is a true and correct copy). The State Water Board staff notice advised junior-priority water right holders in critically dry watersheds that water may be unavailable in order to satisfy senior-priority water right demands.

A water shortage notice, or notice of water unavailability, is a notification to water right holders of a certain priority of right that, due to water shortage conditions, the State Water Board staff has determined water is not available under their priority of right. However, the notice of water unavailability is only a staff determination, it is not an enforceable decision or order of the State Water Board. The notice provides the affected water right holder with the Division's findings of the unavailability of water under their priority of right and the need to cease diversion under that right, the exceptions to the notice for direct diversion of water for power, other nonconsumptive uses and for continued use of previously stored water, and the potential for future enforcement for unauthorized diversions. A water shortage notice does not consider any particular diverter's other senior water rights or alternative basis-of-right such as water supply contracts, private agreements, transfers or groundwater supplies that may allow the diverter to continue to divert lawfully. The notice is therefore not a State Water Board determination that any individual diverter is taking water without authorization under the Water Code. A diverter who continues to divert after receiving a notice of unavailability is not subject to enforcement or penalties for violating the notice, but may be subject to enforcement for an unauthorized diversion if their diversions do not fall within the exceptions enunciated in the notice and are not entirely authorized by other water rights for which water remains available.

On April 25, 2014, Governor Brown issued a proclamation continuing the state of emergency due to the drought which resulted in the State Water Board staff issuing water unavailability notices (WR-25 is a true and correct copy of the April 25, 2014, proclamation). On May 27, 2014, the State Water Board staff issued unavailability notices to all Sacramento and San Joaquin River post-1914 water right holders informing them of the lack of water availability to service their junior-priority water right (WR-26 is a true and correct copy). The unavailability notice extended through the summer, with the last water right holders notified that water was again available for diversion on November 19, 2014 (WR-27 and WR-28 are true and correct copies of the November 2014 notices).

Two months later, similar to 2014, the State Water Board staff issued a notice advising of surface water shortage and potential for curtailment on January 23, 2015 (WR-29 is a true and correct copy). To obtain current and more accurate water right demands for the largest diverters claiming senior (pre-1914 and riparian) rights, the State Water Board issued an

Informational Order, 2015-0002-DWR (WR-30 is a true and correct copy), requesting supporting information for riparian and pre-1914 claims of right, along with their 2014 water use and projected diversions for 2015. The Division incorporated the Informational Order response information into the 2015 demand calculations.

Two months later, Governor Brown issued an Executive Order, Order B-29-15 (WR-31 is a true and correct copy), which confirmed that the prior drought orders and provisions are still in effect due to ongoing drought conditions. After warning post-1914 water right holders of an imminent unavailability notice on April 2, 2015 (WR-32 is a true and correct copy), the State Water Board staff issued an unavailability notice to all post-1914 water rights in the San Joaquin River watershed on April 23, 2015 (WR-33 is a true and correct copy).

A similar staff notice to the Sacramento River and Delta post-1914 water right holders, including WSID, was issued on May 1, 2015 (WR-34 is a true and correct copy; WR-35 is a true and correct copy of the notice addressed to WSID). The May 1, 2015, Notice reflects the State Water Board staff's determination that the existing water available in the Sacramento River and in the Sacramento-San Joaquin Watersheds and Delta is insufficient to meet the demands of diverters with appropriate water right permits or licenses with a priority date of 1914 and later. The methodology underpinning the May 1 Notice is described here and in the Testimony of Jeffrey Yeazell (WR-11).

A similar staff notice to pre-1914 water right holders with priority dates 1903 and later in the Sacramento and San Joaquin River watersheds and Delta, including BBID, was issued on June 12, 2015 (WR-36 is a true and correct copy¹). The June 12, 2015, Notice reflects the State Water Board staff's determination that the existing water available in the Sacramento River and in the Sacramento-San Joaquin Watersheds and Delta is insufficient to meet the demands of diverters with claims of pre-1914 appropriate rights with a priority date of 1903 and later. The methodology underpinning the June 12 Notice is described here and in the Testimony of Jeffrey Yeazell (WR-11).

On July 15, 2015, the State Water Board staff issued a clarification that the earlier 2015 unavailability notices, including the April 23, May 1 and June 12 notices, were not orders to stop diverting (or orders directing "curtailments"), but rather were notices that the State Water Board

¹ WR-37 is a true and correct copy of the mailing list for the June 12 Notice. WR-38 is a true and correct copy of the June 12 Notice addressed to BBID. WR-39 is a true and correct copy of the June 12 Notice issued to Banta-Carbona Irrigation District.

staff had determined that water was not available to serve the rights at the various priorities in the notices. Exhibit WR-40 is a true and correct copy of the July 15 Clarification.²

On September 17, 2015, due to changing conditions, the State Water Board staff issued a notice of water availability for diversion by pre-1914 water rights holders on the Sacramento River, Feather River, and the Delta (WR-43 is a true and correct copy). BBID's claimed pre-1914 right falls within the scope of the September 17, 2015, Notice. On November 2, 2015, the State Water Board staff issued a notice of temporary water availability for water right holders with pre-1927 rights for the Sacramento River and Sacramento-San Joaquin Delta (WR-44 is a true and correct copy). On November 6, 2015, the State Water Board staff issued a notice that water is available for diversion by all post-1914 water right holders in the Sacramento and San Joaquin River watersheds and the Sacramento-San Joaquin Delta (WR-45 is a true and correct copy). WSID's License 1381 is within the scope of the November 2 and November 6, 2015, Notices.

Supply and Demand Analysis

General Overview

Prior to issuing a notice of water unavailability during the 2014 and 2015 drought, Division staff determined the availability of water for water rights of varying priorities in various watersheds by comparing the current and projected available water supply with the total water right diversion demand.³ The supply and demand analysis concept was developed in response to the 1977 drought, and is used to determine the necessity for issuing a notice of water unavailability compares the available natural water supply with the total water right demand by month for a given watershed. See WR-69, which is a true and correct copy of a graphical summary of a fictitious watershed having three priority of rights (riparian, pre-1914 and post-1914) with varying monthly demands plotted against a natural supply line. This graph, which was prepared in 1977, illustrates the concepts the Division used as a starting point for our analysis in 2014 and 2015. This type of graph summarizes all the water supplies and demands

² WR-41 is a true and correct copy of the July 15 Clarification issued to BBID. WR-42 is a true and correct copy of the July 15 Clarification issued to WSID.

³ This drought supply and demand analysis is often referred to as a "water availability analysis," and is referred to in that way at times in this statement. It is important to note that the Division's supply and demand analysis during the 2014 and 2015 drought is fundamentally different from the site-specific "water availability analysis" prepared by the Division's Permitting unit in response to water right applications. The Permitting unit regularly conducts those water availability analyses, and Division staff and outside consultants are familiar with that process. To my knowledge, as described here, prior to 2014, no Division staff or outside consultant attempted to conduct a drought supply and demand "water availability analysis" since at least 1977.

for a given area and visually presents a comparison of the data for a particular timeframe. WR-69 comes from Division staff files dating back to 1977 and was prepared alongside a report called the 1977 Dry Year report (WR-152 is a true and correct copy of the 1977 Dry Year Report; WR-79 is a true and correct copy of the Dry Year Report Appendix). When the 2014 Drought effort was started in January 2014, I researched past materials in the Division's File Room and discovered the staff report folder along with the formal 1977 report and appendix.⁴ The 1977 report and appendix describe and recommend that the Division conduct a water supply and demand analysis to determine water availability during severe drought conditions. Due to there not being a drought of this magnitude since 1977, the 1977 report was chosen as the appropriate starting point for the 2014 to 2015 analyses.⁵ However, as described here and in the Testimony of Jeffrey Yeazell, the Division adapted the supply-demand analysis to current conditions, and incorporated the best available information regarding supply and demand, while at the same time reacting to worsening drought conditions. The 2015 methodology is therefore an appropriate basis for supporting the water unavailability notices at issue in the BBID and WSID enforcement proceedings.

As one would expect, water demand increases in the summer due to heavier irrigation uses and declines in the fall months after harvest. As for the supply, in the Sacramento-San Joaquin Valley, it builds from the winter into the spring with a peak occurring in early summer after any snow has melted. As illustrated on WR-69, once supply drops and intersects with a demand curve, those water rights above the supply, which correspond to those with the junior-most priority, do not have enough water to supply their demand and are notified accordingly.

To begin the supply and demand analysis for a specific area, like the Sacramento - San Joaquin River Delta Watershed (where BBID's and WSID's points of diversion are located) we begin by looking at the available natural supply as reported by the California Department of Water Resources (DWR).

⁴ WR-69 was authored by Mert K. Lininger who was a program manager in the Division's Application section in 1977. WR-69 was in the 1977 file, but I located it after my deposition in these proceedings. WR-69 is included here for illustrative purposes, and did not form the foundation of the recent actions; the 1977 Dry Year Report provided that foundation.

⁵ Also included in the Division's files, and relevant to this drought, is a 1978 report by the California Department of Water Resources, titled "The 1976-1977 California Drought, A Review." WR-153 is a true and correct copy of this report. The State Water Board's February, 2015, Recommendations for Improving the Administration of the Water Rights Priority System in Dry Years (WR-154 is a true and correct copy) does not provide technical guidance for the 2015 water availability determinations, but the water availability determinations are consistent with that report's general goals.

Watershed Selection

Due to time constraints resulting from the urgency of the worsening drought conditions, Division staff in 2014 chose the watershed boundaries pertaining to the Sacramento River and San Joaquin River based on how they were defined in the 1977 Report. In the 1977 Report, the Sacramento River watershed boundary generally included the area upstream of Shasta along with the streams feeding the Sacramento River all the way down to the northern part of the Delta known as the Sacramento Delta. The San Joaquin River boundary, in 1977, was similarly mapped to include the remaining part of the Central and South Delta known as the San Joaquin Delta with the major tributaries of the Stanislaus, Merced, Tuolumne and San Joaquin serving as the boundaries.

For 2015, Division staff proposed an alternate boundary, with respect to how the Delta demand and supply was allocated, such that the entire Delta geographic boundary was included in both the Sacramento and San Joaquin watersheds, but the associated Delta water use demands were parsed subject to how much monthly supply came from the Sacramento or San Joaquin watershed. For example, if during one month the majority of natural supply entering the Delta came from the Sacramento River watershed, then the majority of total Delta demand, for that month, was allocated to the Sacramento River watershed. Since the natural water supply entering the Delta varies by month, so too would the percentage of demand allocated to the Sacramento and San Joaquin River watersheds.

The rationale behind this “pro-rated” allocation of Delta demand is that since the Delta is hydraulically connected to both the Sacramento and San Joaquin Rivers, the Delta’s fresh water demands should be apportioned based on the percentage of fresh water entering the Delta; i.e., if 80% of the fresh water comes from the Sacramento River, 80% of the Delta’s demands should be assigned, for priority allocation determination, to the Sacramento River watershed. The disadvantage to this allocation method, in comparison to the 2014 and prior method, is that the Sacramento River watershed is assigned a greater percentage of the Delta’s demands since the majority of fresh water entering the Delta comes from the Sacramento River watershed.

In the case of WSID’s point of diversion, even though it is located in the southern Delta, the pro-rated Delta demand allocated to the Sacramento River watershed was so high, due to the meager fresh water supplies from the San Joaquin River, that WSID’s post-1914 unavailability notice for 2015 (the May 1 Notice) was based on the Sacramento watershed analysis. For BBID, the pre-1914 analysis leading up to the June 12, 2015 notice was based on the combined Sacramento and San Joaquin watershed. Ahead of the June 12 notice, the Division prepared a separate San Joaquin River watershed-only pre-1914 analysis, but this

would have resulted in much deeper and earlier cuts for pre-1914 claimants such as BBID. The Division also prepared a separate Sacramento River pre-1914 analyses using both a pro-rated and North Delta method. This analysis resulted in the same determination as the combined Sacramento and San Joaquin watershed analysis ultimately used for the June 12 Notice.

**Supply Data – DWR Bulletin 120, Exceedance Forecasts & Daily Full Natural Flows
- Background**

For the supply curve in each watershed, the State Water Board relies upon third-party full natural or unimpaired flow data supplied by DWR in its Bulletin 120 forecasts (see, e.g., WR-109, page 4, which includes a summary of the May 2015 B120 report that shows forecasts for the San Joaquin River; WR-63 is the full May 2015 B120 forecast). DWR publishes these reports every year from February to May where they forecast full natural flow with monthly updates (see the written testimony of Stephen E. Nemeth, WR-17). The B120 reports include full natural flow stations that provide the largest impact to the referenced river's supplies. For the May 1 Notice, which applies to WSID, being included within the pro-rated Sacramento River watershed analysis as described earlier, we looked at the Sacramento River at Bend Bridge, Feather River at Oroville, Yuba River at Smartville and the American River at Folsom Dam as the full natural flow stations used as supplies from the B120 report. For the June 12 Notice, which applies to BBID, since we used a combined Sacramento River and San Joaquin River watershed in the pre-1914 analysis, we added the Stanislaus, Tuolumne, Merced, Upper San Joaquin, Mokelumne and Consumnes River stations to compliment the Sacramento River sources. (See WR-11, Testimony of Jeff Yeazell.)

“Unimpaired Runoff” or “Full Natural Flow” represents the natural water production of a river basin, unaltered by upstream diversions, storage, or by export or import of water to or from other watersheds. The full natural flow amount is different than the measured stream flows at given measurement points because the gauged flows increase or decrease depending on upstream operations. For example, while a stream gage may report 50 cubic feet per second (cfs) of flow, the full natural flow upstream of that gage may be 100 cfs since an upstream neighbor is diverting the 50 cfs difference. The Bulletin 120 forecast provides a monthly, full natural flow, water supply probability table for certain watersheds. As there is uncertainty with predicting how much water will actually arrive at each location in the future, statistical probabilities in the form of exceedance percentages are provided which estimate, based on current snowpack data and historical trends, how much full natural or unimpaired water is predicted to be available upstream of the referenced location for the rest of the water year (water years run October 1 through the following September 30).

The exceedance percentage, which is listed as the header for each row in the B120 Table (see for example WR-109), is simply the percent of the time that the actual flow is expected to exceed the projected flow. For example, in WR-109, page 4, the first table is for the Stanislaus River below Goodwin Reservoir. Each row of the table is the exceedance forecast percentage with each column being the forecasted month's value in thousands of acre-feet.

One thing immediately noticed is that for past months from October to April, the value is the same for each exceedance forecast and the reason is that there is no uncertainty in what happened for past months, what's done is done. Since WR-109, page 4, was prepared in early May, there was still uncertainty in how much rain would actually be produced going forward hence the different exceedance values for May through September. As the exceedance percentage forecast drops, say to 50%, the forecasted amounts increase since there is now a smaller chance (just 50%) that the actual flows will be higher. Division staff have used DWR's 50%, 90% and 99% monthly exceedance forecasts for its supply and demand analyses, together with DWR's daily full natural flow (FNF) data.

Daily full natural flow data is a calculation, performed by DWR, which uses current stream gage values, known upstream diversions and reservoir data such as changes in storage and posted evaporation numbers, to arrive at the amount of available water for that day. Unlike the monthly B120 forecasts, which are based on actual historical data and current snowpack conditions, the daily FNF is, as the name suggests, a daily tracking tool we use to not only qualify the monthly B120 forecasts but also serves as a "backup" supply in the event the daily-averaged monthly B120 forecast is less than the daily FNF. For example, let's say the monthly B120 forecast was 3,000 acre-feet for a particular 30-day month. On a daily basis, the 3,000 acre-feet monthly value works out to a daily-averaged 100 acre-feet per day. If the daily FNF values are higher than the 100 acre-feet value, we will use them since a higher water supply is of more benefit to water right holders such as BBID or WSID. In other words, when determining the "supply" side of the supply and demand analysis, the Division makes every assumption conservatively in favor of a greater estimate of supply, which is in the favor of diverters because more supply means water will be available for diversions for a longer period of time.

DWR's daily full natural flow calculations are less accurate than the monthly exceedance calculations because they are based on less data than is available at the completion of each month. Due to the time lag between the effect of upstream operations and downstream flow measurements, calculated daily full natural flow fluctuates from day to day. You can view a daily full natural flow sample taken from DWR's website as WR-155, which shows the full natural flow values for the various stations in thousands of acre-feet.

For example, using the “TLG” row within WR-155, this row of data represents the daily FNF values for each day above La Grange Dam on the Tuolumne River. The first column header is 15, which is for September 15th (since that is when that particular query was executed) with each successive column the next day afterwards. The value in the 15th column is 0.19 thousand of acre-feet, or 190 acre-feet. As I mentioned earlier, some of the daily FNF values are revised with most of any changes occurring to the most recent data which are the columns on the far right of the table. For the days where a “---“ is displayed, no data has been posted, which I understand could be due, for example, to the local reservoir operator not supplying data.

In its supply and demand analysis, in terms of analyzing the amount of water supply available for diversion, Division staff used a combination of DWR forecasted data supplied by the B120 along with the daily FNF data that has actually been measured. WR-47 is a graphical representation of this methodology at the time of the May 1, 2015 Notice, which applies to WSID. WR-48 is a graphical representation of this methodology at the time of the June 12, 2015, Notice, which applies to BBID.

Supply Data – DWR Bulletin 120, Exceedance Forecasts & Daily Full Natural Flows - Application

In the initial stages of a drought supply and demand analysis, the Division will chart the DWR-calculated daily full natural flow as a check against which DWR B120 exceedance forecast to use. For example, if the daily FNF is tracking very close to the 90% monthly supply forecast, we will use the 90% supply forecast as our estimate for analysis. On the other hand, if the daily FNF is tracking between the 90% and 50% forecast, we will use the 50% forecast to base our decisions on; in each case erring on the side of caution and of most benefit to water right holders.

In the case of the May 1, 2015 notice affecting WSID, Division staff chose the 50% and 90% forecasts from the four full natural flow stations in the Sacramento River watershed to use. For the June 12, 2015 pre-1914 notice affecting BBID, we also included the San Joaquin and Eastside Streams to compliment the Sacramento supplies since the June 12, 2015 notice was a combined watershed analysis. In both cases, the supplies were totaled from February through May 2015 for both the 50% and 90% supply forecasts. Since DWR does not provide a 90% or 99% forecast for the smaller eastside streams entering the Delta (i.e. the Cosumnes and Mokelumne Rivers), the Division used DWR’s 50% forecast amount to add to the total which is more generous and, again, provides more supply to the analysis which benefits diverters.

As we move into the late summer period, sometimes the B120 forecast will estimate

zero flow, as was the case for the seven FNF stations in the global San Joaquin River watershed. Despite this, the DWR-calculated daily FNFs may still yield a small positive value.

For example, for the San Joaquin tributary analysis in the summer of 2015, the May 2015 B120 monthly forecast (WR-109, page 4) for the Stanislaus, Tuolumne and Merced Rivers in August and September was zero for the 50% through the 99% exceedance percentages. However, the daily FNF, while low, was above zero for some days so we used the daily FNF trend as a supply estimate. In WR-78, which is a supply and demand graph for the San Joaquin River prepared in August 2015, we see the blue daily FNF line above the B120 supply forecast for July and August (dark blue-50% and violet-90% hashed lines). Since the daily FNF is slightly positive, we used that daily FNF trend in our monitoring since higher supply is of most benefit to the water right holder; even a small positive supply is better than zero.

However, since recent daily FNF data is sometimes revised, any additional unavailability decisions would need to be based off a trend rather than recent data. Daily FNF can change quickly with these revisions. See WR-156 and WR-157, which are true and correct copies of recent supply and demand graphs of the Yuba River watershed, which show the change in the daily FNF over just 9 days. In these two graphs, we see the blue line which represents the daily FNF, smoothing out in the August month. For this reason, analysis decisions in the late summer for both unavailability determinations and potential long-term availability determinations (resulting in the release notices) are based on a daily FNF trend, however, if the B120 monthly forecast is zero, we exclude the recent 5-7 days worth of data that is often subject to revision.

As a check against supply forecasts provided by DWR, unimpaired flow forecasts provided by the California-Nevada River Forecast Center (a federal department under NOAA) under their website's Ensemble option (<http://www.cnrfc.noaa.gov/>) were referenced, from time-to-time, along with real time flow conditions using United States Geological Survey gages (<http://ca.water.usgs.gov/>) . The NOAA unimpaired flow forecasts, while representing different locations, were generally comparable in magnitude to DWR's.

Moreover, DWR continued to provide us with an updated, non-published, June 50% supply forecast (see WR-82, true and correct copy of an email from Sean DeGuzman dated June 8, 2015) in an effort to incorporate late season precipitation events. The June 50% supply update, while appreciated, did not appreciably alter the analysis leading to the June 12, 2015 decision to issue unavailability notices.

We also use the daily FNF values, which are calculated separately from the B120 monthly values, to verify that the B120 monthly forecasts are appropriate. As you can see in WR-52, which is an analysis from August, 2015, that incorporates the monthly values for June,

the combined Sacramento-San Joaquin graph shows a B120 forecast point for June and the daily FNF line above the B120 point for the first half of the month and below for the latter half of the month, averaging out close to the B120 value. This showed us that DWR's monthly B120 forecasts were appropriate when issuing the water unavailability notices in April through June of 2015, including the May 1 and June 12 Notices.

San Joaquin River & Delta Supply Supplements – Return Flows & Valley Floor Sources

Due to the lower elevations of some areas of the Delta, including some below the incoming tide, Delta diverters often pump lower quality water off of their parcel into the channel while at the same time diverting higher quality water from the channel onto their land. As a result, these diverters may use a smaller net quantity of fresh water, in comparison to the actual amount diverted, for irrigation. The Division attempted to address this occurrence by adjusting the supply and/or demand estimates within the Delta.

The Division met with San Joaquin and Delta stakeholders on May 12, 2015 (see WR-80, true and correct copy of a meeting invitation with Delta and San Joaquin stakeholder, including representatives from many of the parties in these actions) to discuss return flows and additional supply sources to be considered for the drought water supply and demand analysis. During that meeting, the stakeholders indicated that applying a 40% reduction to the reported irrigation demand for the Delta would be appropriate to address the actual net irrigation demand. The Division applied this 40% demand reduction by either increasing the available supply, through an adjustment, or by reducing the reported demand.

In addition to these Delta supplements, and following direction in the 1977 Dry Year Report, we added additional supply owing to return flows from the valley floor as specified in the 1977 report. Return flows are simply the excess flow not needed by the irrigated crop (also called irrigation runoff) that return to a stream system. Page 6 of the Appendix to the 1977 Drought report specifies varying percentages by month of return flow for the San Joaquin River watershed (see WR-79). The 1977 Drought report did not allocate any return flows (see page 4 of WR-79) for the Sacramento River.

Lastly, as the full natural flows available to the Sacramento and San Joaquin River watersheds include the B120 stations mentioned earlier, additional supply was added for the other smaller tributaries. DWR's Bay Delta Office published a 2007 report titled, "California Central Valley – Unimpaired Flow Data" which was used to supplement the full natural flow supply for these areas (WR-76 is a true and correct copy of the 2007 report). The 2007 report provides full natural flows for a variety of water year types. Due to snowpack levels in 2015

being the lowest on record, Division staff opted to choose the 1977 full natural flow values for the excluded areas to best represent a 2015 estimate, since the 1977 snowpack was the next worse value relative to 2015. These excluded area supply values were added to the global Sacramento and San Joaquin River watersheds.

Watershed Supply Summary

Adding up the full natural flow station values (see WR-109, which includes the May B120 summary) with the additional return flow adjustments for the Delta and Valley Floor gives us a monthly total in acre-feet, which is converted into an average daily cubic feet per second for graphical purposes (at two or more exceedance levels). The purpose of converting the monthly total in acre-feet into a daily rate is so that the daily full natural flows can be charted on the same time step, i.e. an apples-to-apples comparison. For example, here is a summary table of the total supply used for the San Joaquin watershed in June. The first row is the total B120 supply forecast for the six FNF stations listed with the second row the expected return flows producing a total of 1,924 cfs for June. WR-78, which is the San Joaquin River watershed 8/19/2015 graph, shows the 1,924 cfs data point as the dark blue point labeled, “Adjusted 50% FNF Forecast” directly above the month of June, which begins the dark blue hashed line.

FNF FORECAST ADJUSTMENT (CFS)		
	June	Reference
CDEC 50% Exceedance FNF Forecast	1,462	Sum of GDW, LGR, EXC, MHB, TLG, and MIL
Return Flow	462	
Adjusted 50% Exceedance FNF Forecast	1,924	

Now that we have a basic understanding of the supply side, we can now move onto the demand side of the analysis.

Demand Data – 4-Year Average Demand & Informational Order Data

To analyze the demand data, the Division relied upon the water right users themselves, who are required to submit their actual monthly use online every 1-3 years, depending on the type of right. The water right users are required to submit this information accurately and to the best of their knowledge, so this represents the best available demand data.

Since riparian and pre-1914 users are on a 3-year reporting cycle, the most recent year’s demand was not available for all users (i.e. a third of the pre-1914 and riparian users had their 3-years of use ending in one year, the next third a year later and so on). For example, BBID’s 2010-2012 reported use is referenced in WR-85 through WR-87, but BBID will not need

to report its 2013-2015 use until 2016. Since only the 2010, 2011 and 2012 complete use reports have been submitted, we only have an estimate for future use using an above-average precipitation year (2010) and two average years (2011 and 2012) of which the three-year average may be underreporting actual use in a drought year (i.e. 2014 and 2015). Due to the drought urgency, the Division staff did not have time to refine the demand analysis to account for these staggered reporting dates during the 2014 analysis. But the Division staff implemented a slightly different analysis in 2015 to account for these differences.

During the 2014 drought, the Division used the most recent complete reported demand that was available. Due to the above triennial reporting, the Division only had a complete record of demand for all riparian and pre-1914 water rights for the 2010 year. Unfortunately, 2010 was an above average year for rainfall and not as reflective of a drought year demand.

For the 2015 drought, the Division used a four-year average (years 2010 to 2013 or whatever years in the 2010-2013 range that were available) demand to best represent projected demand for 2015. Since 2014 demand was not due until July 1, 2015, the four-year average demand did not include 2014.

Going a step further, the Division issued an Informational Order in February 2015 (WR-30) which required the top 90% of riparian and pre-1914 water users to provide their 2014 demand in advance of the July 1, 2015 due date as well as their projected 2015 demand by March 6, 2015. The Informational Order was issued to the largest water users in the Sacramento River, San Joaquin River and Sacramento-San Joaquin Delta, and also required monthly reporting of 2015 use, due early the month following any diversions, as a check against the use of their 2014 demand in our 2015 analysis.

In the demand calculation, for the recipients of the Informational Order, their four-year average demand was replaced by the reported 2014 demand. Those not subject to the Informational Order had their demand represented by the four-year average demand described above. For WSID, since they hold a license, Division staff used their 2010-2013 average demand. BBID, being a recipient of the Informational Order, submitted their 2014 and 2015 projected use along with supporting documentation of their pre-1914 claim of right. WR-88 includes a summary report, prepared in response to the Division's February 2015 Informational Order, of BBID's 2014 actual use by month with an estimate for their projected 2015 use. WR-89 is a service area map BBID provided to support their pre-1914 claim of right. The Division included BBID's Informational Order response along with all of the other responses received to adjust the projected 2015 demand data.

Including the Informational Order data, including the data submitted by BBID, resulted in decreased projected demand, which means more water was available for various water right classes for a longer period of time in 2015, as compared to what would have been available using the methodology employed in 2014. This is another example of how the Division's drought water supply and demand analysis methodology in 2015 made every effort to err on the side of caution in favor of diverters.

Demand Data– Parties Claiming Both Riparian and Pre-1914 Water Rights

For water right holders in the Legal Delta boundary, where BBID's and WSID's points of diversion are located, claiming both a riparian and pre-1914 water right, special consideration was taken. For these holders, stakeholders representing their interests advised that in the event a pre-1914 notice of unavailability was issued, the holders claiming both would "roll over" their pre-1914 amount into the more senior priority riparian right. Provided there are no portions of the water right holders' land that would not qualify as riparian, this approach is allowed since the pre-1914 claim is redundant for direct diversion (i.e., no storage).

To address this possibility, Division staff assigned all reported demand as riparian for those that reported use under both a riparian and pre-1914 water right within the Delta. If Division staff had not taken this course, any demand savings under a pre-1914 unavailability notice may not have been realized since the water right holder would have routed that pre-1914 demand into their riparian priority to compensate.

Demand Data – Quality Control Check

AS described in the Testimony of Jeffrey Yeazell (WR-11), State Water Board staff performs quality control checks on the reported data by removing obvious errors, adjusting the data for excess reporting (i.e., correcting reported irrigation demand in excess of a generous 8 acre-feet/acre water duty, which is the worst case scenario water duty for rice), removing demand for power generation where no water is consumed, removing other nonconsumptive uses such as aquaculture, and making additional changes based on stakeholder comments.

The Division posted its water right demand data on its website and invited the public to comment on and correct the data. The Division only received comments from MBK Engineers, a consulting firm for certain water right holders in the Sacramento and San Joaquin watersheds. MBK provided comments on the demand data, which included both the 2014 reported use data for the top 90% of watershed riparian and pre-1914 demand and the 2010 to 2013 four year average demand for the remaining diverters.

Treatment of Delta Demand – Pro-Rated Analysis

Since the Sacramento-San Joaquin Delta is hydraulically connected to both the

Sacramento and San Joaquin Rivers, and both the Sacramento and San Joaquin supply different amounts of water, the fresh water demands of the Delta are complicated in a supply and demand analysis.

In 2014, the Division used the method adopted in 1977, where the area known as the North Delta had its demands assigned to the Sacramento River analysis, with the Central and South Delta's demands assigned to the San Joaquin River. The problem with this approach is apparent when the San Joaquin River does not supply enough fresh water to satisfy the Central and South Delta demand (as was the case in 2015). In this case, the Sacramento River, being the dominant source of fresh water to the Delta, must bear the burden of any demand not satisfied by the San Joaquin River fresh water supply.

To address this problem, Division staff opted to allocate a proportion of the total Delta demand to both the Sacramento and San Joaquin River analyses based on their respective supplies to the Delta. We proposed this approach in our meeting with San Joaquin River stakeholders on May 12, 2015 (WR-80) who embraced the concept as this would reduce their Delta demand allocation and allow them to divert for longer.

The pro-rated demand method totals the full natural flows from select stations in the Sacramento and San Joaquin watersheds and then applies a pro-rated monthly percentage of the Delta demand to that watershed. For example, if, for a given month, 10 units of full natural flow were projected in the Sacramento and 5 units for the San Joaquin River, for a total of 15 units, two-thirds (10/15) of the total Delta demand would be assigned to the Sacramento River analysis with the remaining third (5/15) allocated to the San Joaquin River analysis. As the 2015 summer months approached, less water was available from the San Joaquin River and consequently less Delta demand was assigned to the San Joaquin River analysis.

This pro-rated allocation of Delta demand was more equitable to the San Joaquin watershed than the 2014 allocation since the entire Central and South Delta demand greatly exceeded the small fraction of Delta demand assigned to the San Joaquin River watershed in 2015. For example, the estimated demand attributed to the San Joaquin Delta diverters in 2014 was about 70 percent of the total Delta demand for riparian and pre-1914 rights from May through September, so the 2015 analysis with a maximum of 17 percent attributed to the San Joaquin watershed is conservative for the San Joaquin watershed diverters. These prorated percentages change monthly based on the adjusted full natural flow projections provided by DWR's Bulletin 120 forecast.

Watershed Demand Summary

Using the reported demands for either 2014 for the informational order recipients or the

2010-2013 four-year average for all others, the State Water Board staff displays the demands graphically according to their respective priorities with the riparian rights at bottom, and the pre-1914 appropriative right demands added and depicted above the riparian demand since all the post-1914s were already advised they were curtailed. The monthly amounts are averaged into cubic feet per second for graphical purposes. WR-78 is the supply and demand analysis for the San Joaquin River watershed with the pro-rated Delta demand published to the Division's website on August 19, 2015. As shown, after the June 12, 2015 unavailability notice was issued, the daily full natural flow dropped quickly into the riparian demand thus confirming, after the fact, the Division's June 12 decision.

Bringing it all together – Supply and Demand Comparison

As you can see from WR-47, which is the April 29, 2015 graph showing conditions at the time of the May 1, 2015, Notice, there is insufficient supply to service all post-1914 water rights between the 90% and 99% forecast points (blue and violet dots) which are applicable with the daily FNF trending closer to the 99% forecast line. Looking hindsight at WR-54, which is an October 30, 2015 graph of the Sacramento River watershed with proportional Delta demand, we see that the daily FNF supply trended in the pre-1914 demand levels from May through August. Since the actual daily FNF supply beginning in May 2015 and continuing through August 2015 was not sufficient to satisfy all pre-1914 reported demands, this graph confirms that there was not enough natural flow to satisfy WSID's post-1914 demand from May 1 onwards.

In the case of BBID, at the time the June 12 notice was issued, Division staff based its decision on the June 10, 2015 combined Sacramento/San Joaquin graph⁶ (WR-48) which showed the combined daily FNF trending downward at ~11,000 cfs and the B120 monthly forecast total even lower at ~9,000 cfs. Since the daily FNF was higher, we based our decision to issue the notices on the daily FNF supply trend, which was about 2,000 cfs less than the demand reported through the 1902 priority year. Looking hindsight, the Division's decision to issue pre-1914 notices at the 1903+ priority level on June 12th was appropriate, as seen in WR-52, which shows the same combined graph two months later. WR-52 shows the daily FNF dropping precipitously in mid-June into the riparian level of demand before July 1. The abrupt mid-June drop in daily FNF into the riparian demand area shows that there was not enough supply to satisfy the remaining pre-1903 water right demands; thus confirming no water was available for BBID's junior priority diversion from June 12 onwards.

⁶ Due to limited San Joaquin watershed supplies in comparison to the Sacramento River sources, the Division opted to include the San Joaquin watershed with the Sacramento in the analysis leading to the June 12 Notice, because a separate San Joaquin only analysis resulted in deeper cuts to pre-1914 users

A separate analysis (see WR-81) was performed after issuing the BBID ACL, which compared the upstream flow at Vernalis, as measured by a gage, to the pro-rated downstream senior Delta demand which included the 1902 and earlier pre-1914 and riparian users. The Vernalis gage is a location just upstream of the Delta where water quality requirements are often measured. The significance of the Vernalis gage is that it can confirm whether there is enough measured flow (which is different than the full natural flow since measured flow may include storage releases) at its location to satisfy remaining downstream pre-1903 water right demands, which are senior to BBID's priority.

In the WR-81 comparison, the Division used the same pro-rated percentage method of total Delta demand assigned to the San Joaquin watershed used in the April 23, 2015 notice and compared that demand with the available flow at Vernalis. This comparison shows that the measured flow at Vernalis was insufficient to service the pro-rated remaining senior demand for at least the June 13 through June 25 time period of the ACL Complaint. An additional demand line, seen as a red hashed line (on WR-81), was included in the comparison which displays the entire Central and South Delta demand (which was typically assigned to the San Joaquin watershed and used in the 2014 supply and demand analysis) vs. the substantially reduced pro-rated demand.

This comparison shows that even under the best-case scenario of using the smaller pro-rated Delta demand, the available flow at Vernalis was needed by downstream senior right holders (riparian and pre-1914 rights with a priority before 1902) and was not available for BBID's diversion during the June 13 through June 25 time period set forth in the ACLC. Moreover, this comparison also demonstrates that no water was available to serve WSID's License 1381 at any time after the May 1 Notice, until November 2015.

Water Unavailability Notice with Supporting Graphs

WR-36 and WR-83 are complete and accurate copies of the June 12th and June 16th notices sent to BBID. The notices are the same type of unavailability notices that are described above. The June 16th notice clarifies to the Delta Diverters' claiming both riparian right and pre-1914 appropriative right that only their pre-1914 right is affected by the notice. The notices are staff determinations only, and do not constitute a decision or order of the State Water Board or a determination that BBID or any other individual diverter has engaged in an unauthorized diversion of water under the Water Code. The notices do not constitute a determination of the validity of claims to divert water.

WR-48 is the supply and demand analysis posted to the Division's website on June 12, 2015. As shown, as of mid-June 2015, both the daily full natural flow trend and B120 supply

forecast for June support the water unavailability notices issued to those diverters with a 1903 and later priority date. Similarly, with respect to WSID, Division staff prepared the same supply and demand analysis for the Sacramento River watershed which included the entire Delta (see WR-34, which is the May 1 Notice, and WR-47, which is the analysis graph supporting the May 1 Notice).

BBID ACL Complaint

Issuance of the ACL Complaint

As described in the testimony of Paul Wells (WR-15), BBID currently only has a single pre-1914 claim of right, Statement S021256, filed on June 30, 2010, for the diversion of water from the Intake Channel to the Banks Pumping Plant in Contra Costa County. The priority date for S021256 is May 18, 1914, as provided by material submitted in response to the Division's February 2015 Informational Order. On June 12, 2015, BBID was notified by mail and through a LYRIS email, to which Rick Gilmore, BBID's General Manager, is subscribed, of the notice of water unavailability which included statement S021256 (WR-107). BBID received this notice no later than June 15 (see WR-106 [BBID's June 15 response]), but likely received it on June 12 with the LYRIS email. Despite this notification, the Division received evidence of BBID's continued diversion, as monitored by the California Data Exchange Center (WR-90) and as discussed in various press publications (see, e.g., WR-10, for the June 13, 2015 to June 25, 2015 time period (see WR-90 and the testimony of Paul Wells, WR-15; see also WR-103 [newspaper article from Thursday, June 25, noting that BBID only shut off its pumps in response to the June 12 Notice on Wednesday, June 24]).

Enforcement Staff developed an ACL Complaint against BBID for the unauthorized diversion of water between June 13, 2015 and June 25, 2015. I reviewed and assisted in the development of the ACL Complaint and the penalty calculation methodology described therein. WR- 4 is a true and correct copy of the ACL Complaint issued to BBID on July 20, 2015. WR-5 is a true and correct copy of the certified mail return receipts indicating service to BBID. WR-6 is a true and correct copy of BBID's request for hearing.

Proposed Civil Liability Amount

Staff analyzed the evidence collected from CDEC and calculated the amount of water that had been allegedly unlawfully diverted by BBID (see written testimony of Paul Wells). To address the unauthorized diversion of water, the ACL Complaint proposes that BBID should be assessed an ACL in the amount of **\$1,553,250** for the unauthorized diversion of water from the Intake Channel to the Banks Pumping Plant based on a calculation that BBID diverted 2,067

acre-feet during the June 13 through June 25, 2015 period. The maximum ACL amount authorized by statute during a drought for an unauthorized diversion is \$1,000 for each day in which the trespass occurred plus a \$2,500 per acre-foot fine. The total potential fine set forth in the ACL Complaint for unlawful diversion of 2,067 acre-feet is \$5,180,500 (13 days at \$1,000 per day plus 2,067 acre-feet at \$2,500 per acre-foot).

Since issuing the ACL Complaint, the Division has received additional information regarding the BBID diversions during June 13 through 25, 2015. Specifically, BBID has supplied a response to the Prosecution Team's October 29, 2015, Subpoena, and Division staff has also continued to investigate the diversions. (See, Testimony of Paul Wells, WR-15.) Based on this new information, the Division has revised the proposed penalty to incorporate the revised calculation of diversion by BBID of 1,887 acre-feet from June 13 through June 24, 2015. Using this amount, the maximum potential liability is **\$4,729,500** (12 days @ \$1,000/day + 1,887 acre-feet at \$2,500/acre-foot using the same formula).⁷

In considering the appropriate amount for the ACL, Water Code section 1055.3 requires that the State Water Board consider all relevant circumstances, including, but not limited to, the extent of harm caused by the violation, the nature and persistence of the violation, the length of time over which the violation occurs, and any corrective action taken by the violator.

In this case, BBID has made unauthorized diversions of water from the Intake Channel to the Banks Pumping Plant (formerly Italian Slough) during the most extreme drought in decades, when there was insufficient water supply available for BBID's claimed water right. BBID was aware that the State Water Board had determined that there was insufficient water supply available for BBID's claimed water right. These unauthorized diversions likely reduced or threatened to reduce the amount of water available for downstream water right holders during an extreme drought emergency. Moreover, BBID's diversions likely reduced the water available for instream resources and riparian habitat within the Delta during an extreme drought emergency.

While it is difficult to quantify for purposes of Water Code section 1055.3 the harm caused by BBID's unauthorized diversions in terms of actual or threatened reductions in water available for downstream water right holders, and it is similarly difficult to quantify any harm caused by the reduction of water available for instream resources and riparian habitat, it is possible to quantify BBID's economic advantage gained through its unlawful diversions. BBID

⁷ As described in the Testimony of Paul Wells, BBID submitted evidence indicating that its diversions ceased after June 24, and that the total diversions during the 12-day violations period may be 1829.1 af, although the evidence is not conclusive. Using this volume, the maximum potential liability would be **\$4,584,750** (12 days @ \$1,000/day + 1,829.1 acre-feet at \$2,500/acre-foot).

received an economic advantage over other legitimate water diverters in the area by foregoing the costs of buying replacement water during the violation period. In this case, the cost of replacement water can be estimated using a June 10, 2015 statement by Mountain House CSD's General Manager (WR-100), as between \$250 and \$1,000 per acre-foot. At 1,887 acre-feet unlawfully diverted, and using the most conservative estimate of replacement cost of water (\$250/acre-foot), BBID's total avoided cost of purchased water is **\$471,750**.⁸

Disincentive Factor

The cost of replacement water alone is not a sufficient basis for setting an ACL under Water Code section 1055.3, because penalties would not be higher than the cost of doing business and violators would have no incentive to comply with the law. Therefore, I determined that using a factor of 3 times the estimated economic benefit is appropriate under these circumstances, given the severity of the drought, the duration and public nature of BBID's violation, and the Division's goal of deterrence. Applying a disincentive factor of three to the replacement cost of water and adding in staff costs in preparing the ACL of \$3,000 brings the recommended ACL amount to **\$1,418,250**.⁹ Should the ACL go to hearing and litigated further, I recommend that all hearing-related expenses be added onto the total liability.

⁸ Using the lower diversion amount suggested by some of BBID's Subpoena response, the total avoided cost of purchased water would be **\$457,275** (\$250/acre-foot times 1,829.1 acre-feet).

⁹ Applying the same disincentive factor to the replacement cost described in the previous footnote, plus adding staff costs, would bring the recommended ACL amount to **\$1,374,825**.